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(54) An apparatus for dispensing pasty or viscous media

(57) A dispenser (11) for pastes and similar materials consists of an external housing (16) and a flexible container (18) positioned therein in the form of bellows. A dispensing pump (13) is positioned on the housing. This pump (13) has a flexible curved pump wall part

(32) and an outlet valve (34) having a lip valve (35) directly moulded on the pump wall part (32). The inlet valve (31) of the pump has a curved valve seat and a superimposed cap-shaped resilient flap valve (30). The container may be completely filled and the elastic bellows ensure that no air spaces are produced.

As a variation, a plunger may be positioned in the container for the medium to be dispensed and said plunger follows up during the discharge of the material.

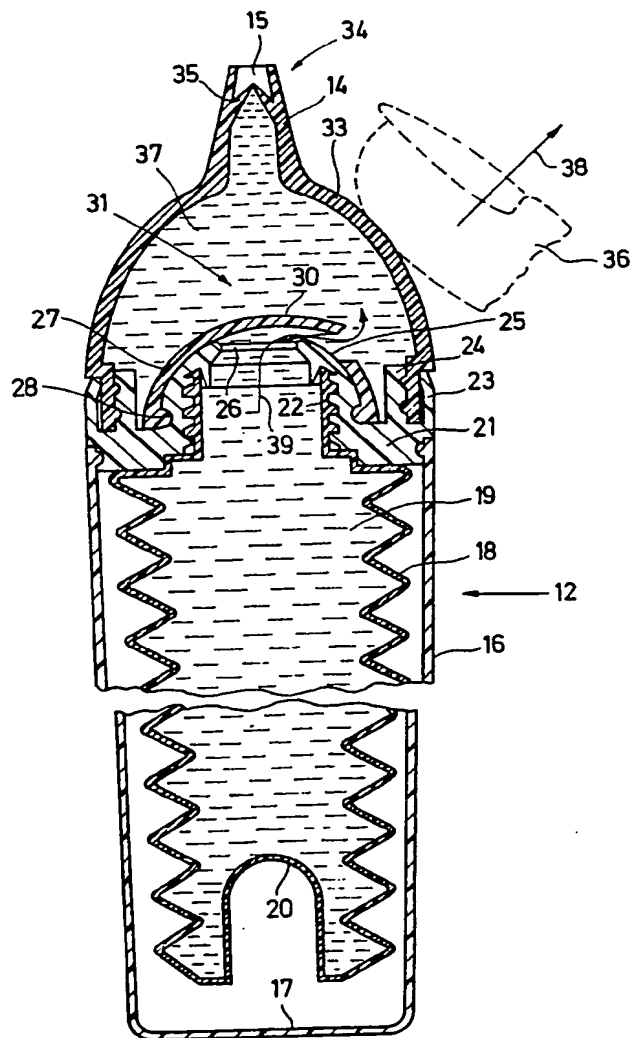


FIG. 2

GB 2 083 142 A

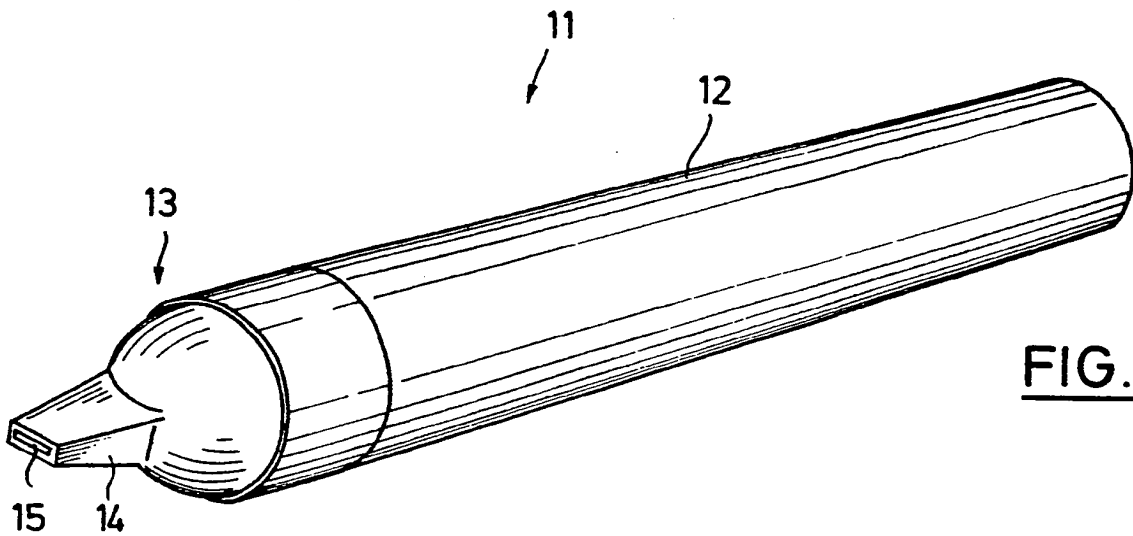


FIG. 1

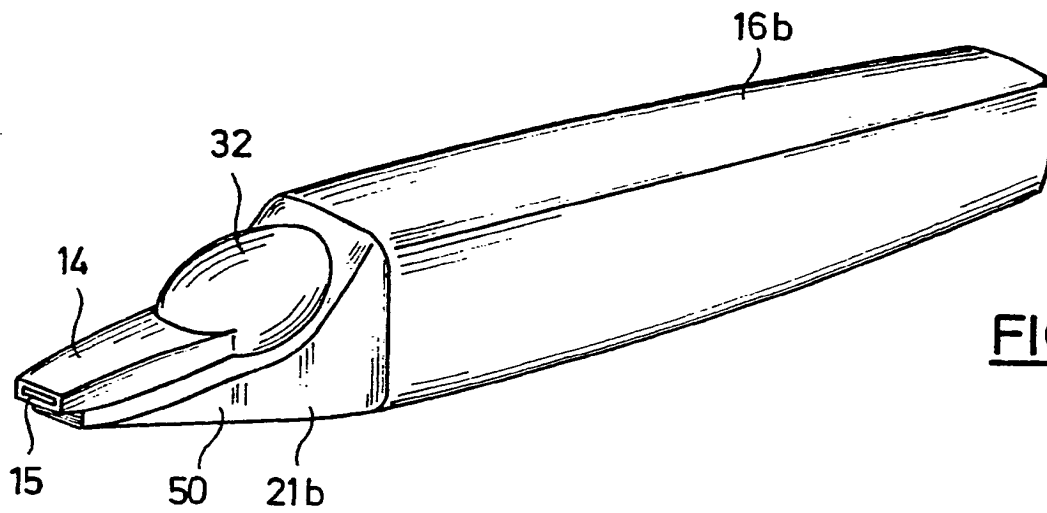


FIG. 5

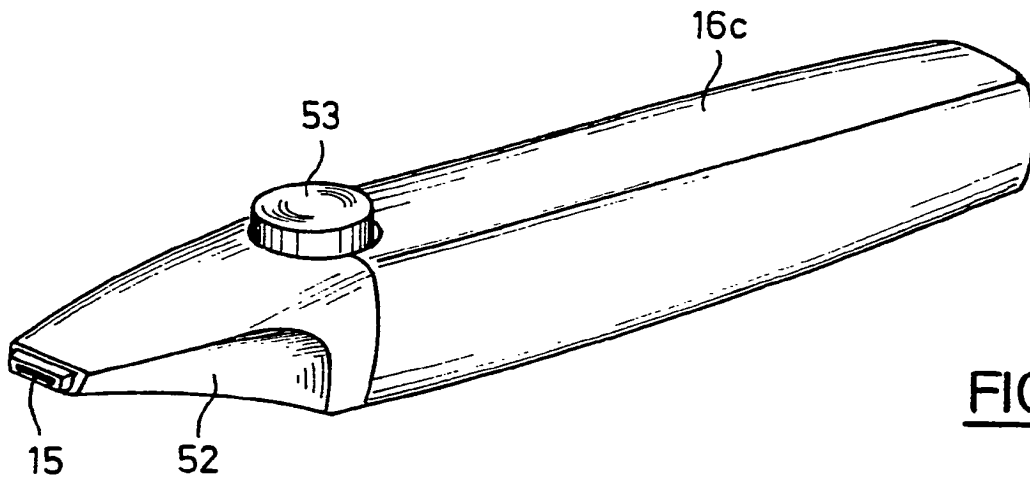


FIG. 6



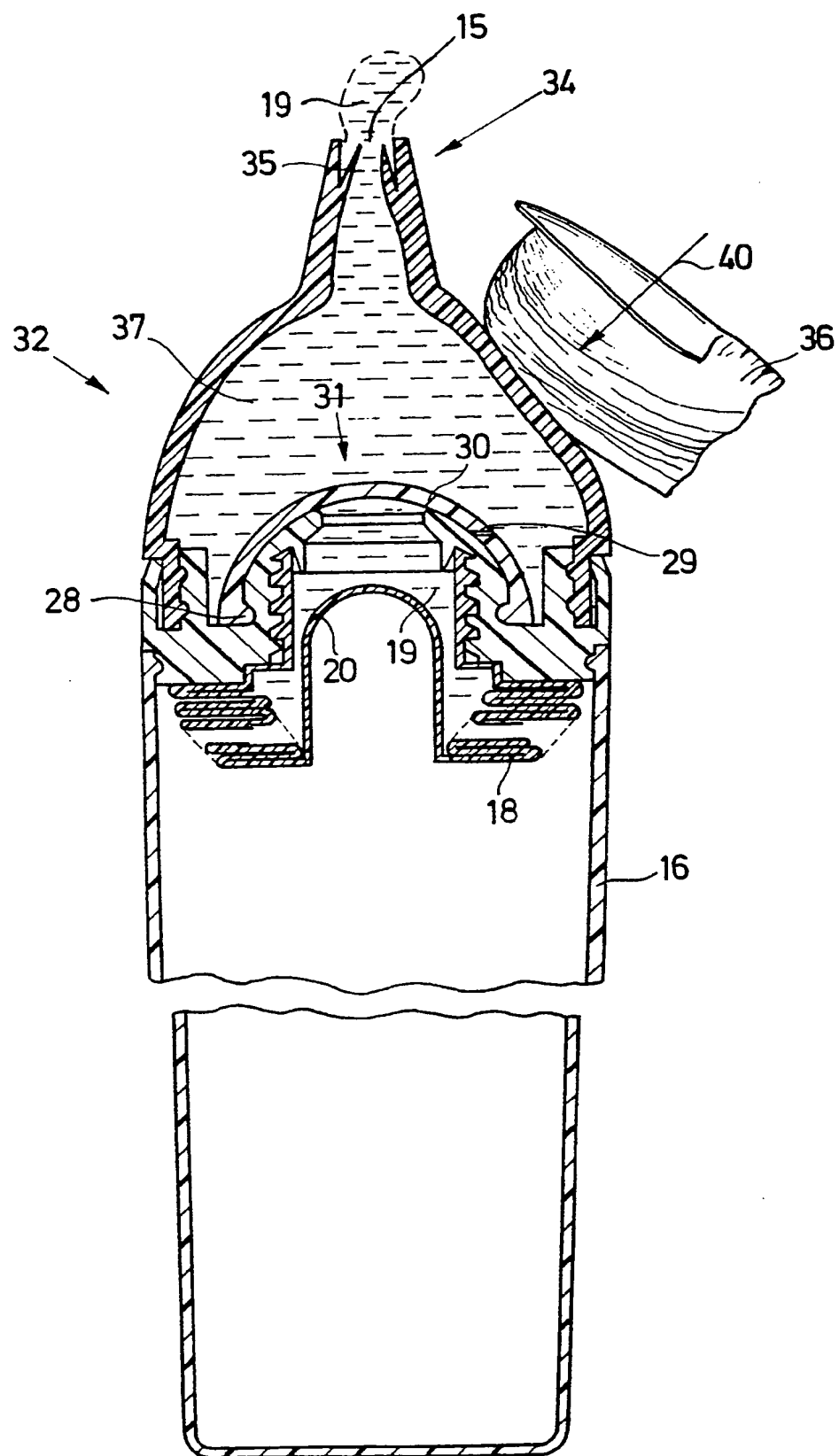


FIG. 3

FIG. 4

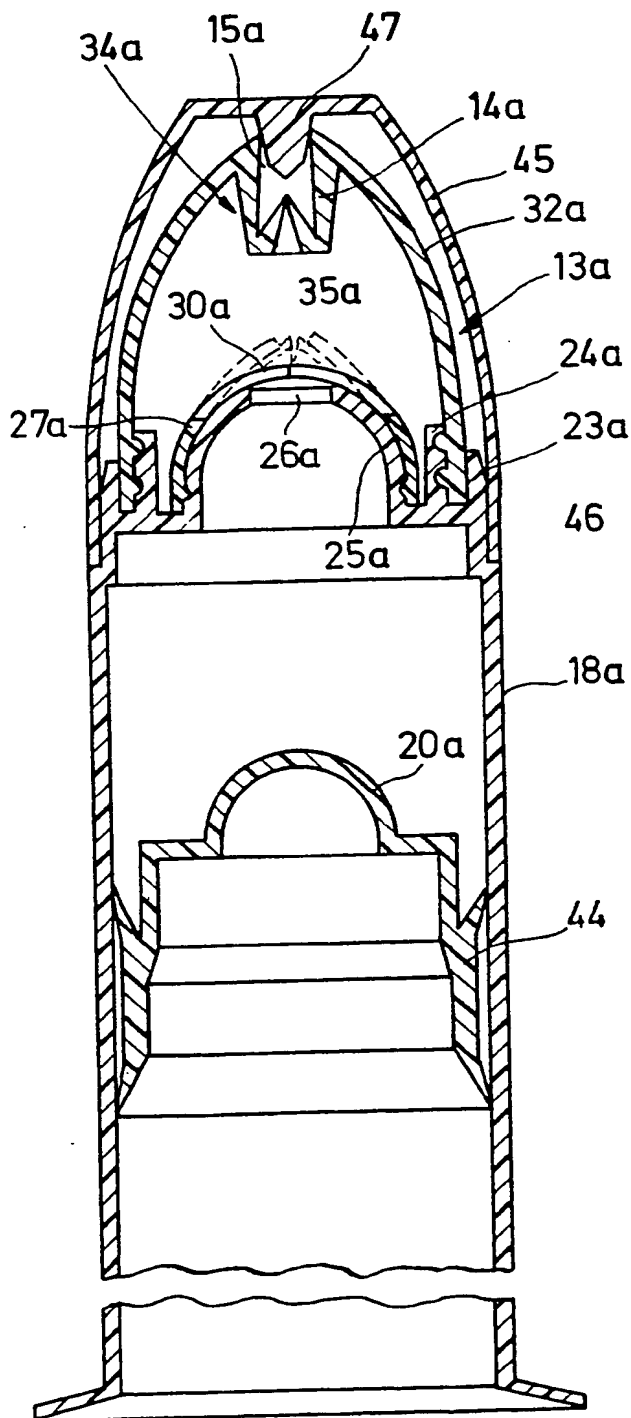
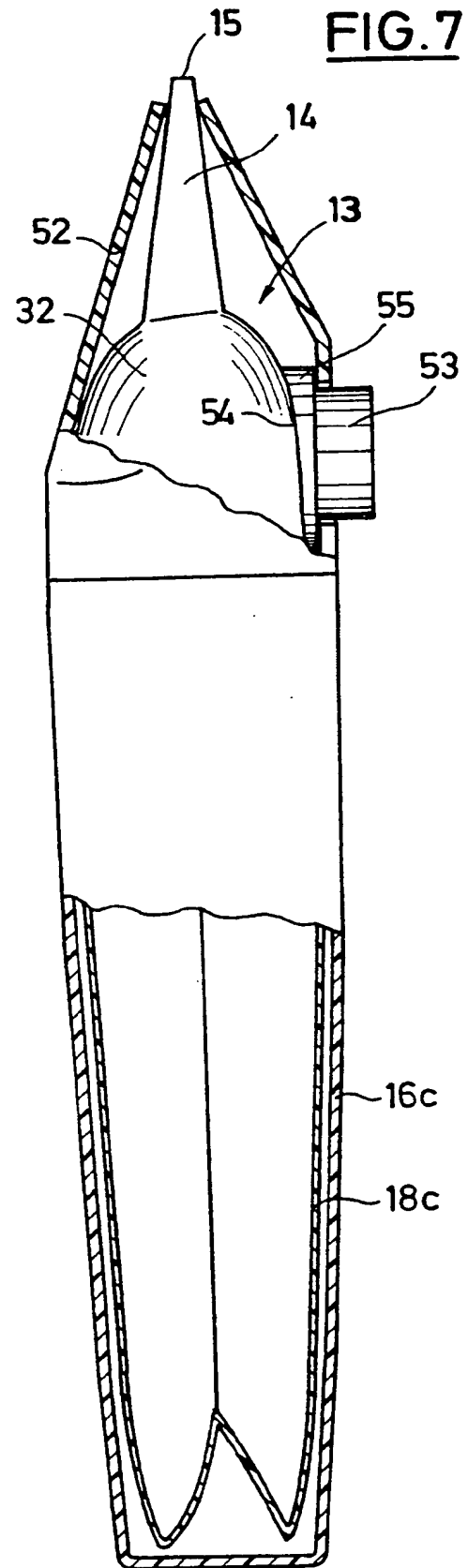


FIG. 7



## SPECIFICATION

**An apparatus for dispensing pasty or viscous media**

5 This invention relates to an apparatus for dispensing pasty or viscous media.

A dispensing apparatus is known from U.S. Patent No. 3,361,305, in which a diaphragm pump is applied to a cylindrical container, the pump having a flat  
10 conical elastic diaphragm, onto the side of which is moulded an outlet connection piece having a spherical outlet valve. The inlet into the flat double conical pump chamber is effected through flap valves. A plunger is introduced into the cylindrical container  
15 and it follows up under a suction effect while the medium is being discharged.

A diaphragm pump is known from German Offenlegungsschrift No. 2,637,132 which has a hemispherical diaphragm. It is clamped over a solid cover part  
20 in which is positioned a valve which may be in the form of a ball valve or a diaphragm valve using the lower edge of the diaphragm. The outlet connection piece is moulded on laterally in the diaphragm and is opened or closed by expanding the diaphragm  
25 circumference during operation.

Furthermore, a dispenser for pasty products is known from German Offenlegungsschrift No. 2,901,717 which has a pump on a cylindrical container having an automatic follow-up plunger seal. The  
30 pump has a rigid pump housing which may be displaced axially with respect to the container, a flap valve is mounted on the outlet connection piece of the pump housing, and an inlet valve is formed by a resiliently loaded disc valve. An elastic annular collar  
35 which is provided between the cover part of the container and the part of the pump chamber provides the restoring force for the pump and simultaneously the sealing of the pump chamber.

All these dispensing devices have the disadvantage either that they are composed of many individual parts or that they are unsuitable for rigorous household use or the like due, for example, to valve constructions which tend to become congested.

An object of the present invention is to provide a  
45 dispensing apparatus which may be produced and assembled from a few simple individual parts and which operates reliably in any position and even under adverse conditions.

According to the invention there is provided an  
50 apparatus for dispensing pasty or viscous media, comprising a container and a pump positioned thereon which is restricted by an elastically deformable, self-restoring part of the pump wall and an outlet valve and an inlet valve in the form of an  
55 elastic flap-valve or lip valve, the container having a wall part which is movable under the suction of the discharged medium, wherein the elastic part of the pump wall is curved in the form of a dome or cupola and is snapped into a cover part which is provided  
60 on or is attached to the container and wherein the outlet valve is a lip valve, the lips of which are moulded from the material of the elastic part of the pump wall, and is positioned on an outlet connection piece projecting from the curved section of the pump  
65 wall and moulded from the material thereof.

The complete pump part may thus be formed of only three component parts whilst nevertheless ensuring reliable operation and imperviousness. The apparatus can therefore be used instead of, for  
70 example, conventional tubes. This has the advantage that an excessive quantity of medium cannot be pressed out by mistake, as often happens in the case of tubes. Furthermore, an undesirable re-sucking action does not take place, which is particularly  
75 important where pharmaceutical preparations are concerned so that it is ensured that no contamination is introduced. The operation of the apparatus is very simple and does not require explanation to a user. Furthermore, there is no danger of leakages  
80 occurring, which may happen if a tube is torn while being compressed.

Particularly when the container holding the medium is a plastics container which folds up automatically under suction, for example a bellows  
85 or a container which folds up laterally, there are hardly any restrictions concerning the shaping of the apparatus, so that it may be designed according to requirements imposed by technical or aesthetic considerations.

In the accompanying drawings:

*Figure 1* is a perspective view of an embodiment of the inventions;

*Figures 2 and 3* are schematic longitudinal sections through an apparatus according to *Figure 1* in  
95 two working positions;

*Figure 4* is a longitudinal section through a second embodiment;

*Figures 5 and 6* are perspective views of third and fourth embodiments; and

*Figure 7* is a partial longitudinal section through the apparatus according to *Figure 6*.

*Figure 1* shows an apparatus 11 for dispensing pasty or viscous materials, for example, foodstuffs, cosmetics and pharmaceutical preparations. The  
105 apparatus 11 comprises a container part 12 and a pump 13 positioned thereon which has an outlet connection piece 14 with an outlet opening 15. The container part 12 is cylindrical or is slightly tapered towards the end remote from the pump and the  
110 pump is directly connected to the container part in an axial direction.

*Figures 2 and 3* show that the container part 12 has an external housing 16 which tapers from its upper part connected to the pump towards the base 17  
115 and, like all other parts of the complete apparatus, is made of plastics. A container 18 for a medium 19 is positioned in the external housing 16, the container being in the form of a plastics bellows, the base 20 of which is curved inwards in order to adapt to the corresponding design of a cover part 21 to which all the individual parts of the apparatus are attached. The container 18 is tightly secured in the cover part 21 by a neck 22 being screwed or snapped in the cover part 21.

The cover part 21 has the shape of a disc from which two concentric annular ribs 23, 24 project towards the pump end and an inlet valve seat 25 projects concentrically into the ribs 23, 24 in the form of an externally substantially spherical projection.  
130 The neck 22 of the container is secured inside the

inlet valve seat 25 and is sealed by a sealing lip. The inlet opening 26 of the pump is in the form of a central, relatively large opening in the inlet valve seat.

- 5 An inlet valve member 27 is secured on the inlet valve seat by an inner annular projection which is snapped into a circumferential annular groove 28 in the inlet valve seat. The inlet valve member 27 is in the form of a hemispherical cap, in which a cap-shaped valve flap 30 of an outlet valve 31 is formed by a horizontal incision 29 in the member 27, which incision however, does not quite penetrate to the other side. The valve flap 30 is such that when the valve is closed it completely covers the inlet opening 15 26 and the edge region thereof rests on the hemispherical external surface of the inlet valve seat 25. The inlet valve member 27 is supported by the annular rib 24 which, together with the inlet valve seat forms an annular groove in the region of the circumferential groove 28 which is directed inwards and thus ensures against automatic detachment.

- An annular groove is also defined between the annular ribs 23 and 24 and an elastic part 32 of the pump wall is fixed in this annular groove by two inwardly directed projections which engage in corresponding circumferential grooves in the rib 24. To secure the part 32 after assembly, the rib 23 may be inwardly deformed in plastic manner so that it rests on the part 32 of the pump wall between the two 20 projections. The part 32 is in the form of a dome or cupola having a generally cylindrical wall section in the region of the attachment and a substantially hemispherically curved and resiliently deformable section 33 on to the centre of which is moulded the axially extending outlet connection piece 14 which, as may be seen from Figure 1, is in the form of a gently convergent channel of rectangular cross section.

- Inside the outlet connection piece, an outlet valve 40 34 is provided in the form of a lip valve having two sealing lips 35 which are moulded from the material of the pump wall part 32 and are directed obliquely to the outlet opening. The sealing lips are triangular or knife-shaped and rest against each other on both 45 sides. They are provided in the immediate vicinity of the outlet opening 15.

- The apparatus just described operates as follows. Figure 2 illustrates the condition of the apparatus in which the container is still substantially full, immediately after an operation at the end of the suction stroke of the pump 13. It can be seen that the bellows are widely drawn apart and nearly reach the base 17 of the external housing. In this position, the bellows are in their slack condition and are completely filled 55 with the medium 19. The elastic curved section 33 of the pump wall, which has been compressed by a person's finger 36, so reducing the pump chamber 37 formed between the pump wall part 32 and the inlet valve part, is in a position shortly before the restoration of its original size, as a result of the retraction of the finger in the direction of arrow 38, to enable this restoration to take place the pump wall part 32 is made of a very elastic material which, however, together with, the advantageous curved 65 form provides a sufficient restoring force to suck the

medium 19, which may sometimes be very viscous, out of the container 18. A very advantageous material for the pump wall part 32 and for the inlet valve part 27 is polyurethane, from which these parts 70 may be injection moulded.

- The medium is drawn by suction out of the container 18 through the inlet opening 26 into the pump chamber, as illustrated by arrow 39, under the suction exerted by this restoring force, during which action, the cap 30 of the inlet valve lifts up resiliently, 75 but closes again as soon as the suction stroke is completed, due to the elasticity of the material and to the fact that the section connecting it to the remaining inlet valve part is curved. The lips 35 of the outlet valve 34 are pressed firmly together under the suction effect and they tightly seal the outlet opening. Due to the fact that the outlet valve is positioned directly at the outlet opening and the elastic movement of the lips 35 dislodges the material located outside the outlet valve, there is no risk of the outlet valve becoming congested.

- Figure 3 illustrates the following forward stroke. The finger 36 now presses in the elastic pump wall part 32 on one side in the direction of arrow 40, as a result of which, the pump chamber 37 is reduced in size and the lips 35 of the outlet valve 34 are opened under the resulting pressure, so that the medium 19 issues out of the outlet opening 15. During this operation, the valve flap 30 of the inlet valve is 95 tightly closed.

- Figure 3 shows the container substantially empty which, of course, only occurs after numerous forward strokes. It can be seen that the bellows are tightly folded up and hardly any medium remains in the emptied container due to the shape of the base of the bellows which is adapted to the inside of the inlet valve seat. It should be noted in this respect that the volume inside the pump is reduced due to the curvature of the inlet valve into the pump chamber and to the adaption of its form to the cupola form of the pump wall part. The size of the pump chamber may be substantially smaller than that which is illustrated in the drawing for reasons of clarity, in each case depending on the deformation, as directed, during the forward movement. However, the medium located in the pump chamber is not lost from use but rather is an occasionally desirable reserve which may also be discharged, for example, by pressing in the pump chamber on several sides. 100 Thus, the user promptly notices when the actual container is empty.

- In the embodiment according to Figure 4, the container 18a is cylindrical and itself forms the external housing. A plunger 44 having sealing lips runs inside the container 18a and the base 20a of the plunger 44 is adapted to the internal shape of the inlet valve seat 25a. Thus, the plunger has a cylindrical projection which carries a hemispherical projection directed towards the pump side. This ensures that as little as possible of the medium 125 remains in the empty container.

- In this embodiment, the inlet valve seat and the corresponding cover construction is designed integrally with the container 18a. In this embodiment as well, there are two annular ribs 23a, 24a which are 130

used to hold the hemispherical inlet valve member 27a and the pump wall part 32a in the previously described manner.

The inlet valve member 27a differs from the member 27 shown in Figures 2 and 3 in that a cross cut is made centrally in the hemispherically curved, elastic moulded part and the cut separates four triangular flaps 30a in the centre region which may lift up in the manner indicated in dashed lines during the suction procedure and thus release the inlet valve opening 26a of the spherical inlet valve seat 25a projecting into the pump chamber. Care should be taken that the opening 26a is either small enough to prevent the flaps from being pressed through to the container during the pressure stroke or that the opening is provided with corresponding supporting bars. However, the curvature of the flaps 30a reduces the risk of their being bent downwards, since they have an increased rigidity in this direction and they are braced against each other in an arched manner by mutual support.

The pump wall part 32a is also made of elastic material having good restoring properties and is designed in dome or cupola manner and has a moulded-on outlet connection piece 14a which, however, in this case projects into the pump chamber. The outlet valve 34a is provided on the outlet connection piece 14a having sealing lips 35a formed integrally from the material of the pump wall part.

A covering cap 45 is provided which is pushed over a corresponding seat 46 on the container 18a and covers the complete pump part 13a. An internal projection 47 of the covering cap 45 projects into the outlet opening 15a of the inlet connection piece 14a and ensures that this opening is always free when the cap is removed. This embodiment is particularly suitable for media which dry up very easily.

The operation is similar to that of the apparatus according to Figures 1 to 3. In this case, however, instead of the contraction of a bellows the plunger travels upwards in the container 18a under the suction of the issuing medium. However, it does not require a downwards check action because it is constantly held in its position by this suction. The lower section of the container 18a has a widening which may serve as a standing foot. This embodiment has the advantage that the container wall 18a is outwardly smooth, and thus an external housing is not required. However, the container must be cylindrical which restricts the design choice available to the designer.

The embodiment illustrated in perspective in Figure 5 corresponds in construction to the embodiment according to Figures 1 to 3. Identical parts are provided with the same reference numerals. However, in this case, the cover part 21b is extended on one side towards the outlet opening 15 and in this design, it is adapted in its internal form to the form of the pump wall part having an outlet connection piece, such that this projection 50 forms a unilateral support for the pump wall part 32 and for the outlet connection piece 14. For this reason, the elastic section of the pump wall part is only accessible from one side for operation by pressing and no bending forces are exerted on the attachment of the pump

wall part on the cover part. Moreover, it is ensured that where the dispensing apparatus is operated vigorously the outlet connection piece does not move laterally, so that an accurate discharge of the medium is possible.

The projecting support section 50 has a convergent shape, as may be seen in Figure 5, which initially extends more steeply on the operation side and is then flatter. It may be seen that in this case, the external housing 16a has a rounded-off square cross section in addition to its slightly conical taper towards the base. This shaping is possible due to the design of the container in the form of bellows which may have any cross section.

The embodiment illustrated in Figures 6 and 7 corresponds to the embodiment according to Figures 1 to 3 as regards the technical features of the pump. A container 18c which is made of relatively thin elastic plastics material is positioned in the slightly tapered external housing 16c which has a rounded-off square cross section and the container has pre-determined folding zones as a result of reinforcements and weakenings in its wall thickness made alternately in the longitudinal direction, in order to fold up under the suction of the issuing medium. In the simplest case, the wall sections may lie flat on top of each other but a star-shaped folding up arrangement is also possible.

A covering 52 is provided for the pump 13, which may either be snapped onto the cover part or may be designed integrally therewith. This covering which tapers forwards encloses the flat, channel-shaped outlet connection piece 14 which, however, slightly projects over the covering with its outlet opening 15. The covering forms a support for the cupola-shaped elastic pump wall part. A round operating button 53 is inserted on one side and has an operating surface 54 which acts on the elastic pump wall and transmits pressure from the finger to the pump. The operating button is held in an opening of the covering 52 by a collar 55. In this case, the elastic pump wall part is completely sealed off and operation takes place in definite manner via a button characterised accordingly. This button increases the design possibilities and does not necessitate any particular requirements in terms of colour or surface quality when selecting the material for the elastic pump wall part. The operation is the same as that described with reference to Figures 1 to 3.

In each case, the apparatus according to the present invention has the advantage that it always retains the same appearance, independently of the extent to which it has been emptied and it remains stable to the same extent or may be accommodated in correspondingly designed holders. It is particularly suitable, for example, to be accommodated as a toothpaste container in the correspondingly moulded recess of a holder for an electric toothbrush. The arrangement of the inlet and outlet valve with a relatively small volume of the pump chamber ensures that in the case of, for example, thermal expansion, hardly any medium issues out of the outlet channel. Although the regularly spherical shape of the pump wall part surrounding the pump chamber is particularly advantageous for operation,



it would also be possible to design the pump wall part differently on one side, for example, to flatten it, e.g. where there is a unilateral support due to the covering 52 according to Figure 7 or to the projection according to Figure 5, or to change the elasticity properties at this point by a corresponding shape or wall thickness.

The external housing may be designed in any manner in the designs using a bellows 18 or a container 18c which folds up automatically, without a substantial loss of volume having to be accepted.

A dispensing apparatus of this type is not substantially more expensive than a metal tube, in spite of its substantially increased usefulness, and it may therefore be used as a disposable container. However, it would also be possible to provide the container with a centre screw connection and to make it re-fillable. In this arrangement, it would also be possible under certain circumstances to supply the bellows 18 or the container 18c as a refill and to insert it into the dispensing apparatus like a cartridge. In the embodiment according to Figure 7, precise metering will be ensured in a particularly simple manner if the button is pressed through up to a predetermined stop.

#### CLAIMS

1. An apparatus for dispensing pasty or viscous media, comprising a container and a pump positioned thereon which is restricted by an elastically deformable, self-restoring part of the pump wall and an outlet valve and an inlet valve in the form of an elastic flap valve or lip valve, the container having a wall part which is movable under the suction of the discharged medium, wherein the elastic part of the pump wall is curved in the form of a dome or cupola and is snapped into a cover part which is provided on or is attached to the container and wherein the outlet valve is a lip valve the lips, of which are moulded from the material of the elastic part of the pump wall, and is positioned on an outlet connection piece projecting from the curved section of the pump wall and moulded from the material thereof.

2. An apparatus according to claim 1, wherein the outlet connection piece is moulded on in the centre region of the curved part of the pump wall.

3. An apparatus according to claim 2, wherein the outlet connection piece is in the form of a flat, relatively long nipple having a slit-shaped outlet opening.

4. An apparatus according to any preceding claim, wherein the cover part or the part of the container supporting the pump has an inlet valve seat projecting into the pump chamber with openings between the container and the pump chamber and the seat is covered by an elastic inlet valve member.

5. An apparatus according to claim 4, wherein the inlet valve seat and inlet valve member have cooperating surfaces which are hemispherical.

6. An apparatus according to claim 4 or 5, wherein the inlet valve member is secured by snap action to the inlet valve seat.

7. An apparatus according to any of claims 4 to 6,

wherein the inlet valve member has at least one incision separating at least one inlet valve flap.

8. An apparatus according to claim 7, wherein cross-wise incisions are provided.

9. An apparatus according to any preceding claim, wherein the outlet valve is closely adjacent to the end of the outlet connection piece and has two opposed lips which co-operate with each other.

10. An apparatus according to any preceding claim wherein the elastic part of the pump wall is operable by a push button which is guided in a cover part which at least partly surrounds the pump.

11. An apparatus according to any one of claims 1 to 9 wherein the elastic part of the pump wall is supported on one side on a housing part the housing part only covers the pump wall part on one side, so that the pump wall part is exposed on the other side for direct manual operation.

12. An apparatus according to any preceding claim wherein the container is a plastics bellows which is adapted to fold up automatically under suction and is surrounded by an external housing.

13. An apparatus according to claim 12 wherein the base of the container has a form which is adapted on the pump side to the section facing it.

14. An apparatus according to any one of claims 1 to 11 wherein a plunger is slidably received in the container the plunger being movable towards the inlet valve under suction.

15. An apparatus according to claim 14, wherein the plunger has a form which is adapted on the pump side to the section facing it.

16. An apparatus according to any preceding claim wherein the pump wall part and/or the inlet valve is snapped fitted in annular grooves of the cover part or of the container.

17. An apparatus according to any preceding claim wherein, a covering cap is attached to the pump, the cap having a projection engaging in the outlet opening.

18. A dispensing apparatus substantially as herein described with reference to any one of the embodiments shown in the accompanying drawings.

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